Vmed Technology

Vet-Dop2™

Doppler Blood Pressure System
Model BF2

User Manual

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ACCESSORIES AND COMPONENTS

Check Vet-Dop2 storage pouch and ensure the following items are included

- Vet-Dop2 Doppler
- Sphygmomanometer
- Headset
- Battery charger
- Coupling gel
- Six cuffs (#1, #2, #3, #4, #5(or #7), #8
- Six probe attachment straps
- Application DVD (NOTE: DVD shows photos of an earlier Vet-Dop model)
- Optional protective pouch

PRECAUTIONS

- ***CAUTION: Use only the battery charger provided by Vmed.*** Laptop charging plugs may appear identical but their use may damage electronics and void the warranty. (***NOTE: For safety, the Vet-Dop2 will not operate under AC/charger power. Unplug the charger before use.)***
- Protect sensor face from sharp objects and clean often
- Grasp the sensor plug to insert and remove the sensor. Do not pull on cable.
- For veterinary use only. Vet-Dop2 does not have FDA registration for human use.
- Do not use in the presence of flammable anesthetics.
- Protect the Vet-Dop2 and cable connectors from moisture (See cleaning instructions in Chapter 3).
- Do not autoclave the Vet-Dop2 or accessories.
- Do not disassemble the Vet-Dop2 enclosure. It contains no operator serviceable components and opening the enclosure voids the warranty.

Chapter

1

Chapter 1 Description

Vet-Dop2 Doppler

Vmed designed the Vet-Dop2 for veterinarians to measure systolic blood pressure on awake animals; to check blood pressure in surgery; to monitor blood flow at the extremities during surgery and to check for intact blood vessels after trauma and before amputation. The non-invasive Doppler technique is the method of choice for measuring blood pressure in animals weighing less than 10 pounds, especially cats. Other methods, including monitors that use the oscillometric technique even with small animal validated software, may not calculate pressures as quickly especially on awake, smaller patients. The-Dop2 also works well on larger breeds and can detect blood flow at the base of the tail in horses.

Monitor blood flow sounds with the integral speaker or with the headset, which when plugged in, disables the speaker since speaker sounds may startle the animal. The Vet-Dop2 uses a sensitive 9.4 MHZ, focused piezo-electric sensor held in place with the finger and thumb of one hand while stabilizing the limb with the remaining fingers. Use one of the Velcro straps to attach the sensor to the limb for long term monitoring. A pressure pump and gauge (Sphygmomanometer), stereo audio headphones, six cuffs, instructions and a procedural video are included with each Vet-Dop2. The cuff set covers most animals from kittens to large dogs with limb circumferences from 3.3 cm to 16.8 cm.

Doppler Technique

Doppler detects blood flow in arteries and veins. Doppler blood pressure is a manual technique using a Doppler flow detector to listen to electronically produced blood flow sounds with the sensor placed proximal to a cuff of suitable size. Use the sphygmomanometer to inflate the cuff until the artery is occluded and the blood flow stops. Increase the pressure 20 to 30 mmHG above the occlusion pressure and then decrease the pressure by slowly deflating the cuff using the thumb valve on the pump. When blood flow audio resumes, read the systolic pressure on the gauge as the needle passes this point. For accuracy record five measurements, eliminate the highest and lowest measurements and take the mean of the remaining. The mean is the indirect systolic blood pressure.

The Doppler technique depends on successful acquisition of the Doppler blood flow signal. Body temperature, vasoconstrictive drugs, a bent limb, too much hair and inadequate lubrication of the area contribute to difficulties in acquiring an adequate signal.

Description of Controls and Indicators (Refer to Figures 1 and 2)

Indicator Lights *(NOTE: LED locations are only visible when illuminated.)*

LOW BATTERY (Status) Light: The LOW BATTERY LED illuminates YELLOW when the unit requires a charge ***(NOTE: You may use the Vet-Dop2 at normal performance for about an hour after light first illuminates).***

CHARGE Light: The charge light will turn YELLOW or AMBER during charging. The light will turn GREEN when the battery is fully charged. ***(NOTE: Battery requires up to 4.5 hours to become fully charged.***

POWER Light: A red LED over the power button will illuminate when the unit is on. ***(NOTE: Press and immediately release the power button to turn on; press and hold button down to turn off***)

Control Panel

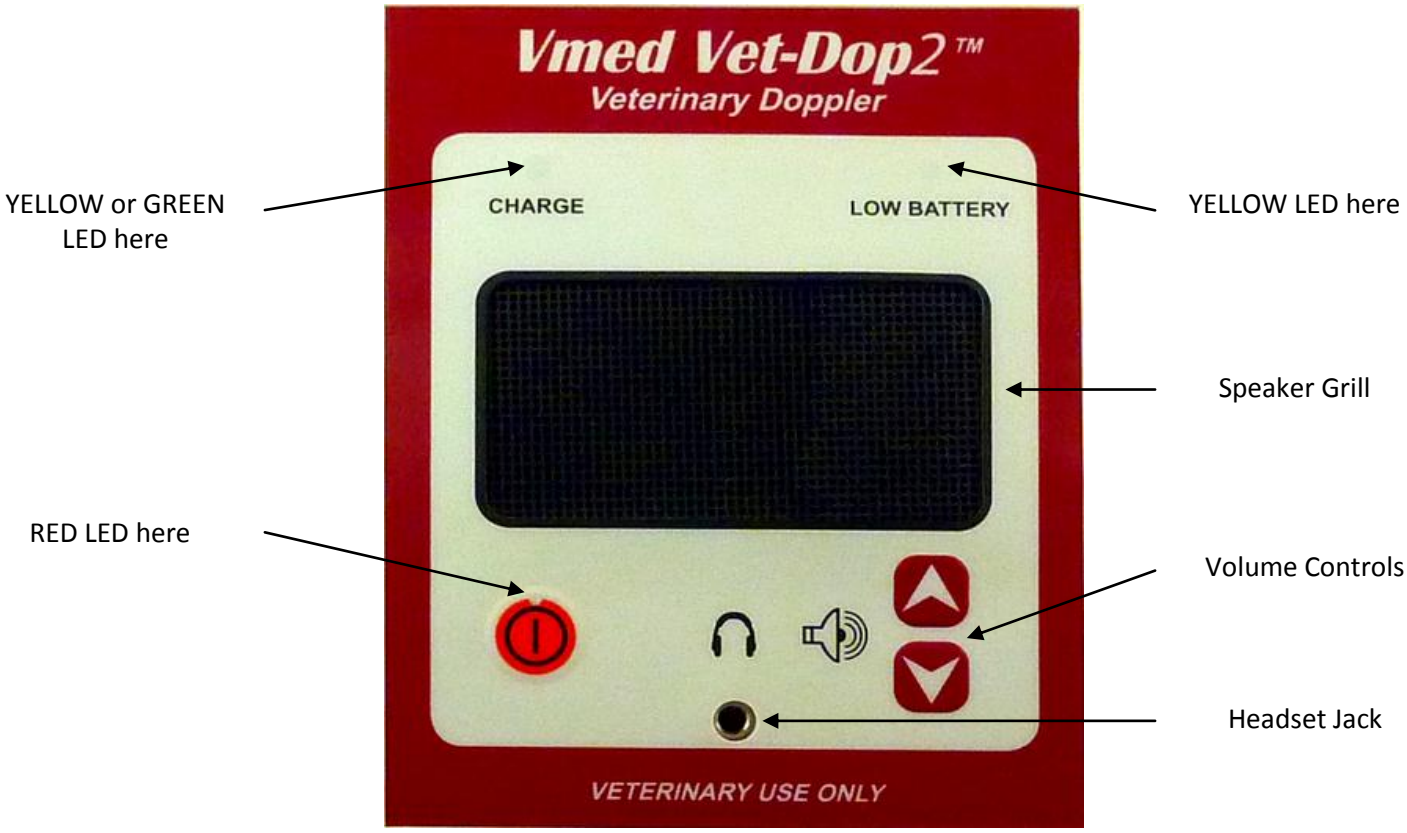


Figure 1 – Top panel with controls and indicator lights

Connector Panel

The connector panel includes the battery charge port and the Doppler sensor receptacle as shown below.

Figure 2 Connector panel

CHARGING RECEPTACLE: Plug the battery charger cable into the CHARGER port to charge the battery. ***(NOTE: For safety reasons, the device will not operate when the battery charger is plugged in.)*** **(*CAUTION: Use the power supply adapter provided with the Vet-Dop2 ONLY. Use of any other power supply adapter could damage the unit and void the warranty.)***

PROBE RECEPTACLE: Insert the Doppler sensor into the PROBE receptacle. **(*NOTE: The sensor plug is keyed and can only be inserted one way-see Fig. 3).***

SERIAL NUMBER: Each device has a unique serial number as shown above.

Chapter

2

Chapter 2 Preparation and Use

Doppler Preparation

Ensure that the Vet-Dop2 is fully charged and assemble the unit, sensor, headset, appropriate cuff, ultrasound gel and alcohol. Turn on the Vet-Dop2 by pressing and immediately releasing the red power button on the keypad. Do not hold the button down unless you wish to turn the device off.

Connect the sensor probe to the Vet-Dop2 by plugging into the keyed receptacle (***NOTE: Cable will face in the direction shown in Figure 3.)***

Figure 3 – Connecting Doppler probe and charger

Cuff Selection

Choose the appropriate cuff as shown in Figures 4 and 5.

Figure 4 – Reference mark should fall within range

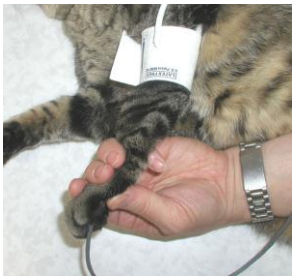
Figure 5 – Reference mark is also artery mark

Doppler Procedure

Doppler detects blood flow in arteries and veins. The radial, cranial, tibial, and median coccygeal arteries are the most practical to monitor. Our preference is the cranial tibial artery because the hair clipping that is required is least noticeable. However, the other two arteries are acceptable and preferred by some. When using the median tibial artery for cats, place a 2-4 cm wide cuff above the hock. Stress must be minimized is to get meaningful blood pressure readings. Allow your patient a few minutes to rest in a quiet place away from other animals before proceeding. The presence of the owner is very helpful in relieving your patient's stress. Take advantage of this if possible. ***(NOTE: Ensure that all comparable measurements for each animal is taken at the same location because pressure will vary with location.)***

1. Assemble the Doppler unit before addressing the patient. If you believe Doppler audio will agitate the patient, plug in the headphones and place the headset over your ears.
2. Position the cuff proximal to the hock, proximal to the elbow, or at the base of the tail, depending on the artery used. (***NOTE: Cuff size in width should be 40% of the circumference of the limb at the site of placement. Making use of the size gauge printed on the cuff will ensure that a cuff of the correct width is used.)***
3. Turn the unit on and verify that the volume is set in the high range and then turn the unit back off again. **(*NOTE: Arterial blood flow may be difficult to detect if the volume is set too low.)***
4. Clip hair as short as possible at the palmar aspect of the foot just proximal to the metacarpal pad. Wet the hair with alcohol and rub a small amount of ultrasound gel into the skin in the midline area where the palmar arterial arch, located slightly medial to the midline. You can palpate the pulse on large dogs. (***NOTE: Clipping the hair may NOT be necessary if hair is short and very fine and is first wetted with alcohol.)***

5. Select an animal cuff with a width approximately equal to the width of the limb and up to two times the width of the forearm measured at the mid-radial region. Vmed blood pressure cuffs have a handy reference gauge to assist with proper cuff selection. Place the artery reference arrow printed on the cuff over the in-tended artery. Wrap the cuff around the limb. The reference arrow should fall within the circumference range marked on the cuff. The cuff should be place with the line and arrow over the intended artery.
6. Apply ball of gel to the cup of the sensor. ***(NOTE: Do this with the power off since loud noise is generated when gel is applied.)***
7. Place the sensor over the artery and either hold it in place with thumb and forefinger or strap to the limb using a Velcro strap or surgical tape for surgical monitoring.
8. Turn on the unit once more and move the sensor slightly to acquire the blood flow signal. Apply enough pressure to hold the signal but not so much as to occlude the artery.



9. Squeeze the bulb on the sphygmomanometer until the reading is approximately 20-30 mm Hg over the pressure where blood flow stops. Slowly deflate the cuff by turning the thumb wheel on the valve and mark the systolic pressure on the gauge when blood flow sounds resume. The first signal will be a shorter and choppier sound than the swishing sound heard before inflation.
10. Detection of diastolic pressure is possible on some animals by carefully listening to the signal quality as the cuff continues to deflate toward zero pressure. You will hear a weak "swishing" sound at this point that corresponds to a very small back flow of blood corresponding to the diastolic pressure. You may also detect a slight oscillation of the needle at this point confirming the audio signal. ***(NOTE: Reproducible readings are not always possible.)***
11. Take five measurements, discard the high and low readings and average the remaining three.

Tips for using the Doppler:

Review the original Vet-Dop procedure video. ***(NOTE: This video shows the older Vet-Dop, but the procedure is the same.)***

Do not strap the transducer to the limb if the animal is awake. The slightest movement of the foot or limb may move the sensor off the artery and the signal will be lost. By holding the sensor in place, a slight movement of the thumb can relocate the signal.

Use the highest audio volume that is comfortable. Although headphones are somewhat cumbersome, they minimize the stress of the procedure. Speaker noise will frighten some animals, especially cats, elevating their blood pressure. The headphones bypass the external speaker.

Sensor failures occur mostly from damage to the sensor cable. Take care not to sharply bend the cable particularly at the junction of the sensor face and the plug. Protect the sensor face from contact with hard or sharp objects.

Ultrasound gel is preferred, however KY jelly or any water based gel is a suitable alternative. Do not use ECG paste, baby oil or any other oil based fluid with the sensor head. These products may cause deterioration of the resin surface of the sensor. Remove gel from the sensor face after each use with a wet, fine bristle toothbrush.

Comfortably extend the animal's limb when taking the reading. A flexed limb may abnormally restrict the blood flow through the artery giving no readings or falsely low readings.

Signal acquisition depends on limb temperature, limb flexation, vasoconstrictive drug use, amount of hair or fur and proper lubrication of the site. (***NOTE: Pre-wetting the limb with alcohol or water may increase detection.)***

Clinical References

Hypertension

Cats: Systolic pressure greater than 170-180 mmHg
Dogs: Systolic pressure greater than 180 mmHg

Hypertension in an unstressed, awake animal

Larry Tilley, DVM, DACVIM (Internal Medicine), VetMed Associates, Santa Fe, NM

Doppler in Surgery

"Doppler flow technology presents several desirable characteristics over other monitoring devices as a surgical monitoring device. The ability of the Doppler to measure blood flow in a peripheral artery and generate an audible sound with each pulse provides the surgeon with an 'eyes free' way to evaluate their patient's cardiovascular performance while continuing to focus on their surgery. If the peripheral Doppler sound is good, the systolic blood pressure is within an acceptable range, and with a sphygmomanometer above the Doppler transducer, the systolic pressure can be easily and economically measured and entered into the anesthetic record. Although diastolic pressure cannot be measured this way, the reliability of Doppler blood pressure monitoring allows the anesthetist to spend less time fiddling with the monitor and more time monitoring the patient. Heart rate can also be monitored audibly and recorded. A particularly strong value of the Doppler is the ability of the anesthetist or surgeon to hear ventricular premature contractions (the most common arrhythmia under anesthesia) as a 'dropped sound' in and otherwise stable, rhythmic 'whoosh, whoosh, whoosh'; often in plenty of time to look up at the ECG tracing and watch the VPC go by on the screen! Supplemental ventilation of these patients will often resolve this common arrhythmia. Because the Doppler is portable, it can be moved with the patient easily when moving to radiology or the recovery area. Their low cost relative to other monitoring devices, reliability and toughness make them the best 'bang for the buck' surgical monitoring device in many people's opinion."

Using the Doppler as a Surgical Monitor

R. Randy Bassinger, DVM, ACVS, South Carolina Veterinary Referral Center, Columbia, SC

Chapter

3

Chapter 3 Service, Maintenance and Specifications

Service and Support

Phone: 800-926-9622
FAX: 425-585-0231
Email: info@vmedtech.com
WEB: vmedtech.com/customers (For manual download)
vmedtech.com (For clinical references, parts and accessories)

Cleaning and Maintenance

Cleaning

MONITOR: Wipe with a damp cloth or sponge using any of the below fluids. (***CAUTION: Do not let moisture enter any receptacle, plug opening or the speaker grill.)***

Soap and water

Isopropyl or ethyl alcohol

Peroxide solution

SENSOR: Clean dried gel from probe face with a soft bristle toothbrush under running water. Wipe cable with water or alcohol. (***CAUTION: Do not let moisture enter inside of plug.)***

CUFFS: Use a scrub brush and mild detergent to clean cuffs. (***CAUTION: Do not let fluids enter cuff tubing.)***

Maintenance

There are no field serviceable components inside the Vet-Dop2. Opening the housing voids the warranty. Store this device in the storage pouch when not in use.

Charging the Battery

The Vet-Dop2 uses a rechargeable lithium-ion battery that has a useful life of approximately two to four years. When the battery no longer holds a charge, battery replacement may be required***. (NOTE: Call for support concerning battery replacement.)*** A full battery charge can take up to 4.5 hours depending upon how depleted the battery charge is to begin with. The Vet-Dop2 can not be operated when the charger is plugged in so only charge the battery when the device is not in use.

Specifications

TYPE: CW ultrasonic Doppler blood flow detector
CONSTRUCTION: High impact ABS-PC
DIMENSIONS (OVERALL): 6"x 4.625"x 1.75"
WEIGHT: 15 oz.
DOPPLER FREQUENCY: 9.6 MHz
AUDIO OUTPUT: Speaker and headset jack with speaker cutoff
CHARGER: Input: 110/220 VAC 50 or 60 Hz
Output: 5 VDC (Will not operate unit while charger is connected)
BATTERY: Rechargeable Lithium-ion
BATTERY USE BETWEEN CHARGES: 35-40 hours continuous
TRANSDUCER: Focused piezoelectric elements with 5 Ft. Cable
TRANSDUCER DIMENSIONS: 0.6" X 0.5" X 0.24"
CONNECTOR: 5 Pin circular DIN
SPHYGMOMANOMETER: 0-300 mmHg certified manometer with bulb type pump and deflation valve
HEADPHONES: Stereo audio with 3.5 mm phone plug
CUFFS: 6 ea. for limb circumferences 3.3-16.8 cm

Troubleshooting

A faulty sensor or defective electronic components or both can cause excess noise, static, and difficulty acquiring a signal. Improper application or technique can also be an issue. Refer to the guide below to help identify various problems and recommended corrective action.

SITUATION	POSSIBLE CAUSES	CORRECTIVE ACTION
Cannot detect signal	Patient not optimum	✓ Warm limb ✓ Extend limb ✓ Delay vasoconstrictive drug administration ✓ Clip hair ✓ Wet area with alcohol ✓ Reposition sensor ✓ Increase or decrease thumb pressure on sensor
	Doppler not optimum	✓ Fully charge battery ✓ Check volume controls ✓ Check sensor/cable damage (See below) ✓ Defective electronics
Excess static/noise	Defective sensor	✓ Check for change in sound when cable flexed at plug and sensor face[1] ✓ Call technical support
	Defective electronics	✓ Call technical support

[1] Change in noise indicates bad wire in cable.

Appendix A Limited Warranty

All Vmed Technology products carry the limited warranties described below. All warranty claims must be received by Vmed Technology in written form within the warranty periods specified below or they will lapse.

Limited Warranty. Vmed Technology warrants: Its wireless monitors and IRMA gas sensors to be free of defects in materials and workmanship for two years from date of purchase by the original end user customer; (ii) Vet-Dop Blood Pressure Monitor to be free of defects in materials and workmanship for one year from date of purchase by the original end user customer; (iii) Cables, lead wires and connectors, Doppler transducers, ECG sensors and clips, esophageal probes, temperature probes, blood pressure cuffs and blood pressure tubing sold with all Vmed monitors, or purchased as an optional accessory for such monitors, will be free of defects in materials and workmanship for six months from date of purchase by the original end user customer; and (iv) all other supplies or disposable or single use instruments or products, are warranted to be free of defects in materials and workmanship for the period that ends upon the earlier of initial use for their intended purpose or their expiration date.

Customers who feel an instrument is defective must return it to Vmed Technology for evaluation. Such return must be made in accordance with both the Vmed Technology RMA procedures described below and prior to expiration of the warranty period. Products found by Vmed Technology to be defective will either be repaired or replaced with the same or a comparable product, at the discretion of Vmed Technology. As described below, repair or replacement, at no charge for parts or labor, is the Customer's sole and exclusive remedy. The warranty on any Vmed Technology product is voided if the product is repaired by anyone other than Vmed Technology. Shipping charges are not covered by this warranty. Warranties do not cover general maintenance or cleaning needs that result from normal use. Warranty does not cover the costs of loaner units that customer may request during warranty evaluation or warranty repair. Damage to an instrument or product caused by accident, abuse, alteration, misuse, improper care, cleaning, chemicals, or loss or theft are not covered by this warranty. OPENING ANY MONITOR'S HOUSING (ENCLOSURE) OR THE HOUSING (ENCLOSURE) OF ANY OTHER VMED TECHNOLOGY PRODUCT OR ACCESSORY WILL VOID THE WARRANTY.

Disclaimer of all other Warranties. VMED TECHNOLOGY HEREBY DISCLAIMS ANY AND ALL OTHER WARRANTIES WHATSOEVER, INCLUDING WITHOUT LIMITATION THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE, TITLE OR NON-INFRINGEMENT OF THIRD PARTY RIGHTS. The agents and representatives of Vmed Technology are not authorized to make modifications to these warranties, or to make additional warranties. Any additional statements, whether oral or written, do not constitute warranties and should not be relied upon by the Customer.

Exclusive Remedies of Customer; Limitation of Liability. Vmed Technology's liability and Customer's remedy for damages incurred as a result of any breach of warranty or related to the goods and products provided to Customer or use of those products by Customer or others, is expressly limited to return of the non-conforming or defective goods to Vmed Technology and, at Vmed Technology's option, either the repair of non-conforming or defective goods or the replacement of non-conforming or defective goods with conforming or comparable goods.

THE REMEDIES OF THE CUSTOMER SET FORTH IN THESE CONDITIONS OF SALE ARE EXCLUSIVE. VMED TECHNOLOGY SHALL NOT BE LIABLE FOR SPECIAL, INCIDENTAL, PUNITIVE OR CONSEQUENTIAL DAMAGES ARISING FROM BREACH OF WARRANTY, BREACH OF CONTRACT, TORT, PERSONAL INJURY, PRODUCT LIABILITY, NEGLIGENCE, STRICT LIABILITY, INDEMNITY, OR ANY OTHER LEGAL THEORY, EVEN IF VMED TECHNOLOGY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES OR THE REMEDY PROVIDED HEREUNDER FAILS OF ITS ESSENTIAL PURPOSE. SUCH EXCLUDED DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, LOSS OF PROFITS OR REVENUES, LOST INCOME, CANCELLED PATIENT FEES OR PROCEDURES STEMMING FROM ANY PRODUCT ON BACKORDER, LOSS OF USE OF THE GOODS OR INSTRUMENTS, COSTS OF CAPITAL, COST OF SUBSTITUTE GOODS, FACILITIES OR SERVICES, OR CLAIMS OF CUSTOMERS OR PATIENTS/CLIENTS OF THE CUSTOMER FOR SUCH DAMAGES.

Some states may not allow exclusion or limitation of liability for consequential or incidental damages and therefore the above limitations may not apply to you if such state's laws are found to be applicable to you.

WARRANTY RETURN POLICY

Return of Product for Breach of Warranty. In order to make a claim for breach of warranty or to return a product for warranty or non-warranty repair, Customer must obtain a Return Material Authorization (RMA) number from Vmed Technology customer service at (800)-926-9622. An itemized list of returned products must accompany all returns. The RMA number and explanation of why the product is being returned must be included. Returned goods MUST be packaged in a shipping container equivalent to that in which it was received. Returned goods MUST be shipped pre-paid at Customer's expense by FedEx, UPS, or other service that provides package tracking, and must be insured for the purchase price of the contents. Returned goods received by Vmed Technology in any form less than that described above will be refused by Vmed Technology and returned to the Customer. Vmed Technology will pay the return freight on products repaired or replaced under warranty.

Appendix B Accessories and Replacement Parts

- Doppler sensor, 9.4 MHZ Part BF-94A (cats, dogs and exotics) BF-94R rats
- Certified Sphygmomanometer, Part P801
- Cuff Set of 6 Mixed, Part C200
- Cuff Set of 6 Cat, Part C201
- Charger, Part BPC-1
- Lithium-ion rechargeable battery, Part BP1-1003
- DVD training video, Part V1
- Storage pouch
- Protective pouch with handle

Please phone 800-926-9622 or Email us at info@vmedtech.com for price and availability

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